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# Chapter 12. Surface Storage — CALFED

## CALFED Surface Storage in California

The CALFED Record of Decision (2000) identified five potential surface storage reservoirs that are being investigated by the California Department of Water Resources, US Bureau of Reclamation, and local water interests.

- Shasta Lake Water Resources Investigation (SLWRI) – draft FR / prelim draft EIS 12/2011
- North-of-the-Delta Offstream Storage (NODOS) – draft FR and EIS/EIR 6/2012
- In-Delta Storage Project (IDSP) – Delta Wetlands Project – draft EIR 4/2010
- Los Vaqueros Reservoir Expansion (LVE)
- Upper San Joaquin River Basin Storage Investigation (USJRBSI)

This summary provides a snapshot of the current status of the five CALFED surface storage investigations. Additional information can be found at <http://www.storage.water.ca.gov/>. The general locations of the initial alternatives reflected in the summary below are shown in Figure 12-1 (General location of CALFED surface storage initial alternatives).

### **PLACEHOLDER Figure 12-1 General Location of CALFED Surface Storage Initial Alternatives**

[Any draft tables, figures, and boxes that accompany this text for the advisory committee draft are included at the end of the chapter.]

The 2009 Comprehensive Water Package includes a water bond that may provide a portion of the financing to construct one or more CALFED surface storage projects. The Safe, Clean, and Reliable Drinking Water Supply Act of 2010, if approved by voters, would include up to \$3 billion for storage that improves statewide water system operations. This public money would be used to invest in public benefits including ecosystem restoration, flood management, water quality, emergency response, and recreation. According to the bond proposal, water supply reliability benefits for urban or agricultural users would be paid for by those beneficiaries.

Water resources planning has changed significantly over the past several decades. New approaches to planning for CALFED surface storage has resulted in a new era of project formulations designed to address a new era of water resources needs. The State and federal governments have funded the five surface storage investigations, which were explicitly conceived to support at least three of CALFED's program objectives: water supply reliability, water quality, and ecosystem restoration. From the outset, investigation planners acknowledged that the dam building model of the past (i.e., onstream reservoirs built primarily for agricultural and urban users and flood protection) would not be helpful in solving California's water challenges. In fact, these approaches would likely exacerbate many of the State's water resources problems, especially perceptions about winning and losing in California's water battles. Consequently, CALFED considered new on-stream storage untenable. Offstream storage or expansion of existing storage proposals were considered, but formulations would emphasize effective mitigation of impacts. In addition, these new proposals would not limit consideration of environmental effects to mitigation, but would instead be designed to improve environmental conditions. Project purposes

emphasize multi-objective storage, combining newer objectives associated with ecosystem restoration and water quality with more traditional purposes of water supply reliability, hydropower and flood control. More specifically, these new projects would support aquatic and riparian ecosystem restoration focused on the Delta and its tributaries; improved drinking and habitat water quality; and water supply reliability improvements that ultimately support California's growing population and diverse economy.

The CALFED surface storage project formulations have dedicated significant project resources to public benefits including ecosystem restoration, habitat water quality, and water supply reliability for environmental uses (see Table 12-1 CALFED Surface Storage Initial Alternatives Benefits Summary) that would be paid for by the State and/or federal governments. Contributions to a reliable water supply for California are also explicitly included. Urban and agricultural water supply reliability and drinking water quality are generally considered non-public benefits that would be paid for by water retailers and users. In addition, Tribes could be potential beneficiaries of the projects. Tribes may have interest in any of the benefits previously listed including urban, environmental, and agricultural supply reliability, drinking water quality, and ecosystem restoration.

#### **PLACEHOLDER Table12-1 CALFED Surface Storage Initial Alternatives Benefit Summary**

[Any draft tables, figures, and boxes that accompany this text for the advisory committee draft are included at the end of the chapter.]

California's water resources future has become increasingly uncertain. Consequently, these projects will need to perform well under a number of potential future conditions including climate change, alternative Delta conveyance and management, and disaster/emergency response. Sensitivity analyses will determine a project's effectiveness as precipitation and runoff patterns change and sea level rises, with either existing or new Delta conveyance and management and potential implementation of multiple storage facilities. Storage must also support adaptively managed restoration approaches based on "new or improved science," changes in the viability of species, and modified restoration priorities. While flexibility may be challenging to value, a robust response to various future scenarios will help ensure that projects would remain no regrets investments.

The continuing CALFED Surface Storage Investigations are in their final phase of planning. Funding for In-Delta Storage ended in Fiscal Year 2005; the four remaining investigations are ongoing. State funding for State agencies to participate in the Shasta Lake investigation also ended in Fiscal Year 2005. DWR and Reclamation are coordinating planning assumptions and documents with the Bay Delta Conservation Plan and Delta Habitat Conservation and Conveyance Program so that potential future changes to Delta conveyance can be appropriately incorporated into surface storage planning. Consequently, the agencies anticipate similar release dates as the BDCP/DHCCP Public Draft EIR/EIS for the surface storage investigation's draft feasibility and draft EIR/EIS documents. Final reports will then be completed one year later. DWR and Reclamation plan significant outreach and stakeholder input throughout this final phase and especially during the comment period of the environmental documents. Planning requirements for large surface storage projects are extensive. A more comprehensive listing of regulatory permits and compliances that would likely be required, as compiled by one of the investigations is shown in Tables 12-2 and 12-3.

**PLACEHOLDER Table 12-2 Primary Environmental Permits/Compliance Issues**

[Any draft tables, figures, and boxes that accompany this text for the advisory committee draft are included at the end of the chapter.]

**PLACEHOLDER Table 12-3 Primary Cultural Resource Permits/Compliance Issues**

[Any draft tables, figures, and boxes that accompany this text for the advisory committee draft are included at the end of the chapter.]

## Potential Benefits of CALFED Surface Storage

The size and location of these surface storage projects facilitates the accomplishment of benefits in two distinct ways. First, many benefits are achieved directly by releases from new storage. Second, additional storage can provide significant system flexibility such that other facilities' operations can be modified (without reducing current benefits) to support additional benefits within the system. Additional water in storage can be used to either improve ecosystem functions and conditions for targeted species, or improve water quality or supply reliability for water users. Another important characteristic of these proposals is the geographic location of the benefits. A number of the environmental benefits occur within the Sacramento-San Joaquin Delta. Other environmental benefits are targeted at the Delta's tributaries including the Sacramento and San Joaquin rivers and the Yolo Bypass, recognizing the direct connections between tributary and estuarine health. Water supply reliability improvements are generally for State Water Project and Central Valley Project contractors or environmental uses.

Performance of the CALFED surface storage projects is measured using an operations simulation of the Central Valley Project and State Water Project systems, using the historic hydrologic sequence 1922-2003. CALSIM II provides detailed information related to operations of the system under with and without project conditions. Results are often reported with both average annual values and driest periods (1928-34, 1976-77, and 1987-92) average annual values, reflecting the importance of performance under drought conditions. Drought performance has become increasingly important, as water managers and decision-makers acknowledge challenges we faced with the 2007-2009 drought. This type of comprehensive analysis allows investigators to determine how much water from a proposed project will be used to meet needs that would not be met without the project. In addition, DWR and Reclamation have developed a suite of analytical tools that are used in a coordinated manner with the operations simulation to assess other important characteristics including Delta water quality; Sacramento River temperature, water quality, fishery effects, river meander, sediment transport, riparian success; and water resources economics. DWR, Reclamation, and other agencies have developed a Common Assumptions process that establishes a common set of analytical tools, operations, planning assumptions, and reporting metrics so that projects are evaluated with a common foundation.

More detail associated with specific benefits is shown in Table 12-1 CALFED Surface Storage Initial Alternatives Benefits Summary and is derived from each investigation's plan formulation documents. One initial alternative from each investigation's planning documents is described here and in Table 12-4, CALFED Surface Storage Initial Alternatives Cost-Benefit Summary. The initial alternatives shown here are those with the relative highest benefit - cost ratio for each investigation. These initial alternatives are not feasibility or environmental documentation alternatives and are not necessarily the preferred alternative. However, the initial alternatives described here are being used to inform the development of

alternatives for feasibility and environmental documents that are now in development. Reclamation and Contra Costa Water District released a draft EIS/EIR for LVE in February 2009 with new cost estimates. However, the 2006 initial economic evaluation remains the most recent final document that includes both costs and benefits and those values are shown here. DWR published a state feasibility study report for the In-Delta Storage Program in 2004. A draft supplemental report was released in January 2006. No additional state or federal funding for the program has been received since then. Consequently, study results are not consistent with the Common Assumptions being used by the other CALFED surface storage investigations. The In-Delta storage reports are available at <http://www.water.ca.gov/storage/indelta/index.cfm>

## Potential Costs of CALFED Surface Storage

Costs have been estimated for an initial alternative for each of the CALFED surface storage investigations. The costs shown in Table 12-4 reflect the same initial alternative formulation as described in the benefits section above so that benefits and costs can be considered together. As noted previously, the initial alternatives shown here are not necessarily the preferred alternative, but will be used to inform the alternatives that will be selected and analyzed in the environmental and feasibility planning documents. Costs and benefits are shown as they are reported in each report and older studies have not be updated to reflect same date comparisons of the five investigations. As noted previously, both Los Vaqueros and In-Delta information is from 2006; Shasta is 2007; NODOS and San Joaquin is 2008. Table 12-4 shows the storage capacity, cost, annual cost, annual benefit, benefit-cost ratio, and an estimate of the percentage of the initial project formulation that is dedicated to public benefits, as described in the Safe, Clean, and Reliable Drinking Water Supply Act of 2010. Costs of the initial formulations shown range from \$667 million to \$3.6 billion. Benefit-cost ratio is an indicator of a project's economic justification. The approximate percentage dedicated to public benefits is shown to indicate the portion of the project that may be paid for by the State and/or federal governments. The remaining portion of the cost of each project would then need to be paid for by local and regional water interests. In these initial alternatives, the local and regional water interests are considered to be the contractors of the CVP and SWP.

## Major Issues Facing CALFED Surface Storage

### Climate Change

Climate models project that average temperatures are expected to continue to rise by the end of this century. With warmer temperatures we anticipate more precipitation to fall as rain instead of snow, and snow levels to rise, reducing the total snowpack. In the past few years we have seen a gradual shift in snowpack and runoff timing in California where runoff is occurring earlier in the year than expected.

Although climate temperature models have a higher degree of certainty, it isn't fully understood how precipitation will be affected by climate change as climate precipitation models project little change in precipitation in California before 2050 and projections past 2050 suggest even more uncertainty with either more or less precipitation. SWP and CVP operations are particularly sensitive to precipitation, reservoir carryover storage levels, demand, and Delta exports. Existing system vulnerabilities intensified by a changing climate will potentially reduce water management flexibility, supply, and delivery capability, ultimately changing Delta exports.

## Mitigation

Energy intensity of surface storage could be different depending on net energy input or energy used for construction and maintenance. Surface storage projects could also have some climate change impacts on watershed ecosystems and water quality related to Greenhouse Gases Emissions, however, these impacts are not well defined due to project related uncertainty. Energy use and generation should be defined to evaluate energy benefit with hydropower and net energy production.

Management strategies discussed in this chapter can be used to avoid and minimize adverse impacts on climate change related to energy use and Greenhouse Gases Emissions:

1. Prioritizing future surface storage by assessing energy use and GHG emissions in the feasibility and environmental studies for three CALFED surface storage investigations (NODOS, LVE, and USJRBSI).
2. Evaluating potential project effects and related alternatives (upgrading existing projects or developing new projects) by using climate change mitigation and Greenhouse Gases Emissions as one of the project option selection criteria.
3. Identifying public benefits in surface storage for the state and federal investment in clean energy, water quality, and ecosystem service could have mitigation potential related to energy and GHG emissions reduction.
4. Performing integrated planning with Delta plan, the California Water Plan Update, and the Bay Delta Conservation Plan as well as IRWM with watershed management could provide long-term public benefits with water quality control, vegetation improvement, and ecosystem service, which could have mitigation potential related to carbon sequestration and reducing energy use and Greenhouse Gases Emissions.
5. Planning projects operation to achieve primary purposes of ecosystem restoration and water quality could provide potential benefits related to carbon sequestration and reducing energy use and Greenhouse Gases Emissions.
6. Evaluating energy efficiency and GHG emissions with other water management options such as water use efficiency, water transfers, conjunctive management, desalination, and recycling could provide opportunities for climate change mitigation.
7. Adaptation

Much of the State's infrastructure was built to capture relatively slow spring runoff and deliver water during the summer and fall months. With anticipated changes to the snowpack and runoff timing, increased surface storage would allow greater management flexibility by capturing more runoff as it occurs. Stored runoff will help supplement snowpack capacity reduction by providing a buffer to meet water demand under drier or wetter future climate conditions. While surface storage has the potential to

immediately address vulnerabilities such as water quality and supply reliability, additional surface storage will also allow the system to respond to future climate scenarios such as extreme drought periods. While uncertainties of the State's hydrologic future exist in current climate science, our current framework of understanding demonstrates the need for adaptive capacity and to address system vulnerabilities with additional surface storage.

## Funding for Study

Sufficient and stable State and federal funding are critical to successful completion of the feasibility and environmental studies for the CALFED surface storage investigations. California's Proposition 50 (2002) provided initial stable State funding for the surface storage investigations; Proposition 84 (2006) provides additional funds to complete the studies. In October 2004, the President reauthorized the CALFED Bay-Delta Program. PL108-361 reaffirms federal feasibility study authorization for four of the five storage investigations (SLWRI, NODOS, LVE, and USJRBSI). DWR received no funding to support surface storage studies for the previous state fiscal year 2007-2008. However, appropriation of Proposition 84 funds was approved and the surface storage investigations resumed after State funding became available March 2009 (after twenty months). To efficiently complete the continuing CALFED surface storage investigations, DWR has prioritized its work efforts to focus resources on identifying the most viable projects and project tasks. DWR and Reclamation will work cooperatively to evaluate projects using information from planning studies and reports. Funding instability in the past has caused delays for the investigations. Stable funding will be especially critical during this final phase.

## Effects

Implementation of new CALFED surface storage would affect environmental and human conditions, including economic effects to surrounding communities, as well as flow both up and downstream of diversions and throughout California's water resources system. Some potential effects will be positive and some negative. Regulatory and permitting requirements, as listed previously, will require surface storage investigations to consider, for example, potential effects to stream flow regimes, water quality, stream geomorphology, fish and wildlife habitat, and risk of failure during seismic and operational events. In addition, agencies are developing analytical methodologies to determine greenhouse gas emissions and their contribution to climate change associated with project construction and operations. Mitigation of significant effects is required under State and federal environmental laws and is accomplished through implementation strategies that avoid, minimize, rectify, reduce over time, or compensate for negative effects. Significant input from Tribes, the public, and agencies have already been received by DWR and Reclamation related to effects associated with potential implementation. Additional input is anticipated as feasibility and NEPA/CEQA alternatives are developed and evaluated during the final phase of the investigations.

## State and Federal Interest

A continuing essential task is the identification of State and federal interest in each of the investigations. Identification of State interest is a primary objective of the pre-feasibility studies that will be completed in 2010 for the investigations that DWR is participating in. DWR will identify public benefits (consistent with the description in the bond proposal) that warrant investment by the State. Similarly, Reclamation



will continue to determine federal interest in projects as the federal feasibility studies are developed. In addition, DWR and Reclamation are working with stakeholders to identify which projects have the greatest local interest and possible willingness to pay for project costs. The CALFED surface storage investigations will then use results of all these evaluations to develop federal-State-local partnerships with local and regional interests to continue refining alternatives development and plan formulations. Local and regional water entities have indicated a preference that the State and federal governments express some commitment to potential State and federal investments in the projects prior to their commitment. If partnerships are not formed (demonstrating lack of interest in advancing a project) and/or the outcome of technical and economic studies indicate any of the five projects are not feasible, the State and/or federal governments may decide to defer future studies of specific projects.

## Financing

Implementation of one or more CALFED surface storage projects would likely require multiple types of financing. The Safe, Clean, and Reliable Drinking Water Supply Act of 2010 could provide general obligation bonds to pay for the public benefits portion of CALFED surface storage projects. Repayment bonds could facilitate contractor (i.e., local agencies) participation in benefits to specific water users, as has been provided in the past. Local agencies may also develop their own financing. Federal participation in the projects would potentially make them much more effective. State and federal investment in developed water supplies dedicated to the restoration of the Delta and tributary ecosystems would give fish and wildlife managers new tools to proactively revitalize these ecosystems. Managers could then use these environmental water supplies to support water-required actions that would improve conditions for aquatic and riparian ecosystems and species that depend upon them. These dedicated restoration supplies may prove an essential element in recovery of the Delta, its tributaries, and dependent species. State and federal fish and wildlife management agencies would then be tasked with proactively and adaptively managing restoration water supply assets. DWR and Reclamation are aware that these agencies and the public will want assurances that projects will be operated in a manner to protect these public investments. The federal government may also invest in refuge water supplies or make a capital investment in water supplies for CVP contractors.

## Recommendations to Facilitate CALFED Surface Storage Decision-making

1. CALFED signatories and stakeholders should continue to prioritize work efforts to complete the feasibility and environmental studies of the surface storage investigations.
  - A. As indicated in the funding discussion above, dwr is prioritizing future surface storage work efforts due to insufficient funding to complete environmental documentation and feasibility analyses for three CALFED surface storage investigations (NODOS, LVE, and USJRBSI). Reclamation is prioritizing work on four investigations (SLWRI, NODOS, LVE, and USJRBSI). Prioritization criteria include reviewing conclusions and recommendations from ongoing state and federal planning studies; determining federal, state, and local interest, including willingness to pay; evaluating benefits in light of the bond proposal; and assessing legal and logistical issues related to specific projects.

- B. Engage more stakeholders and potential project participants in the process. The investigations should continue to work with tribes, the public, and agencies in identifying, evaluating, and quantifying potential project effects (i.e. both beneficial and negative effects).
  - C. Develop information on costs, effects and how the projects could be operated for a variety of purposes.
  - D. Continue evaluation and presentation of alternatives and potential future scenarios, including alternative delta conveyance and operations and climate change effects that allow potential participants to assess their interest in specific projects.
  - E. develop mechanisms to provide assurances that projects should be operated in a manner consistent with the objectives.
  - F. assess tribal, federal, state, and local interest in the investigations, including opportunities for State and federal investment in public benefits.
  - G. Add something on integration with IRWM
2. DWR, Reclamation, other CBDA agencies and local interests should continue work with related planning efforts including Delta Vision, the California Water Plan Update, and the Bay Delta Conservation Plan.
  3. CBDA, DWR, and Reclamation should continue their development of conceptual finance plans that include descriptions of relevant State and federal financial policies and a determination of the potential for State and federal investment in benefits to the general public. The scenarios and finance plans may help facilitate potential investment discussions and then decisions by the public as well as local, regional, State and federal decision-makers.

## Linkages to Other Strategies

The CALFED surface storage investigations are inclusive of a number of other strategies in their formulations. As stated previously, ecosystem restoration and water quality are explicitly included as primary purposes of several investigations. Accomplishments related to restoration and quality are achieved by dedication of developed water to these purposes. Other strategies are included as secondary purposes of the surface storage investigations such as floodflow management and water dependent recreation. A major conceptual component of these investigations is related to how these new facilities would be integrated into the existing water resources systems, especially the CVP and SWP systems. In each investigation, new storage integrated into these systems provides unique opportunities to provide benefits associated with system re-operation. In many cases, the existing facilities can be operated in a more efficient manner with additional storage. These re-operative approaches are described in greater detail in each investigation's most recent planning documents.

The CALFED surface storage investigations are also incorporating many other strategies into their planning. For example, a cooperative and collaborative Common Assumptions process has led to agreed-upon assumptions associated with future strategy implementations including agricultural and urban water use efficiency, Delta conveyance, water transfers, conjunctive management, desalination, and recycled municipal water. The CALFED surface storage investigations is one of just a few strategies that assumes increased implementation of other strategies in its planning estimates shown in the water plan. For example, the common assumptions include increased water use efficiency, water transfers, conjunctive management, desalination, and recycling. The Common Assumptions process and assumptions are described in each investigation's current planning documents.

The 2005 Water Plan Update provided a planning roadmap with two initiatives for achieving sustainable and reliable water supplies for California through 2030. The CALFED surface storage investigations fall naturally in the “Improve Statewide Water Management Systems” initiative since the investigations seek to integrate with the Central Valley Project and the State Water Project, California’s largest water systems. The second initiative, implementation of Integrated Regional Water Management (IRWM), is essential to California’s water resources future. Many of the surface storage investigations’ purposes also need to be integrated with local and regional planning efforts. Ecosystem restoration, water quality, and improved regional and local supplies all need to be incorporated into local and regional planning. The new era approach by the CALFED surface storage investigations is very similar to the approach now being promoted through IRWM.

## CALFED Surface Storage in the Water Plan

[This is a new heading for Update 2013. If necessary, this section will discuss the ways the resource management strategy is treated in this chapter, in the regional reports and in the sustainability indicators. If the three mentions aren’t consistent, the reason for the conflict will be discussed (i.e., the regional reports are emphasizing a different aspect of the strategy). If the three mentions are consistent with each other (or if the strategy isn’t discussed in the rest of Update 2013), there is no need for this section to appear.]

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